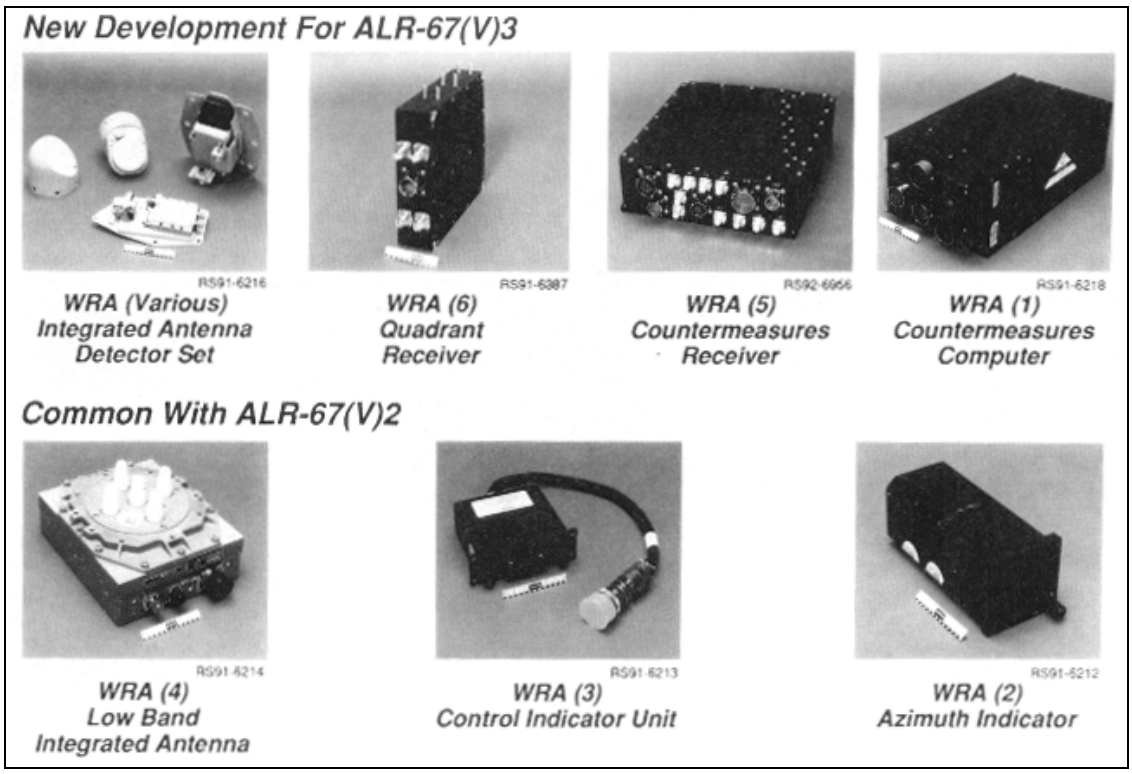
ADVANCED SPECIAL RECEIVER (ASR) AN/ALR-67(V)3



Navy ACAT II Program		**Prime Contractor**
Total Number of Systems:	698	Raytheon
Total Program Cost (TY$):	$1.1B (acquisition)	
Average Unit Cost (TY$):	$1.1M	
Full-rate production:	4QFY99	

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

Advanced Special Receiver (ASR) is a radar-warning receiver (RWR) intended to supersede the AN/ALR-67(V)2, and provides extended capabilities in detection and processing of air defense threat radars of the mid-1990s and beyond, thus contributing to Joint Vision's focus on ***information superiority*** and ***precision engagement*** of enemy forces. It functions cooperatively with the onboard suppression and defensive systems (high-speed anti-radiation missile (HARM)), countermeasure dispensers, and radio frequency (RF) jammer) via data exchanged over the Electronic Warfare multiplex bus and the HARM data bus. The (V)3 ASR is applicable to the F/A-18C/D/E/F. The (V)4 ASR will be applicable to the F-14A/B upgrade, and F-14D, however the AV-8B portion has been canceled. Except for WRA-5, which is split into two parts to alleviate F/A-18 tail structural limitations, and new brackets required for antennas and additional wiring, the bulk of ASR hardware is a form and fit replacement for AN/ALR-67E(V)2 hardware. ASR provides an order of magnitude increase in processing power. ASR collection categories include: (1) high band pulse (2-18 GHz); (2) high band continuous wave; (3) low band pulse less than 2 GHz; and (4) millimeter wave MMW (28-40 GHz). ASR provides signal detection, direction finding, and identification of RF and MMW threat emitters including scanning, pulse-Doppler and continuous

wave tracking, acquisition and early warning radar, and missile guidance. The Low Band Integrated Array in the ASR was not changed from the ALR-67E(V)2. The software re-programmable threat library user data file (UDF) development and maintenance process and infrastructure for the ASR is intended to support improved operational timeliness of UDF updates (i.e., tactical reprogramming).

The AN/ALR-67 (V)3 Advanced Special Receiver (ASR) contributes to ***full-dimensional protection*** by improving individual aircraft probability of survival through improved aircrew situational awareness of the radar-guided threat environment.

BACKGROUND INFORMATION

The ASR is a Navy program that achieved Milestone II in 2QFY87 and Milestone III in 3QFY99. At the present time, the ASR program is in full-rate production for the F/A-18E/F aircraft.

DT&E was conducted at NAWC-AD Patuxent River, NAWC-WD China Lake, NAWC-WD Pt. Mugu, Air Force Material Command Western Test Range, and at contractor facilities from 1992-1998. ALR-67 (V)3 was deployed to the NATO exercise Trial Mace IX in 1QFY98. This deployment provided an opportunity to validate system performance in an open-air environment against several Gray emitters that were not available in the U.S. T&E infrastructure, except as Hardware-in-the-Loop or installed system test facility simulations. At the completion of DT with OT assistance, a determination was made by the program director that ALR-67 (V)3 hardware/software had sufficiently matured to enter technical evaluation (the final phase of DT&E) and OT-IIA.

OT-IIA was conducted from October 1997-January 1998. OT-IIA was conducted in an operational threat environment derived from threat data contained in the Office of Naval Intelligence Threat Assessment (014-97). The purpose of OT-IIA was to assess the potential operational effectiveness and operational suitability of the ALR-67 (V)3 system to support an LRIP decision. As a result of OT-IIA, COMOPTEVFOR concluded that the system was potentially operationally effective and potentially operationally suitable with recommended improvements in identification, localization (Direction Finding accuracy), Built-In Test (BIT), reliability, maintainability, and reprogrammability. These and other changes were incorporated into the design tested in OT-IIB (OPEVAL).

OT-IIB was conducted from June 1998-February 1999 in an operational threat environment, with over 550 sorties and 967 flight hours flown. The purpose of OT-IIB was to determine the operational effectiveness and suitability of the ALR-67 (V)3 system, and to continue tactics development to support promulgation of the OPTEVFOR tactics guide. OT&E was conducted at Eglin AFB (Florida), Sardinia (Italy), the ECR (China Lake), Nellis AFB (Nevada), Alaska, and onboard an aircraft carrier operating off the coast of Southern California. ALR-67 (V)3 was examined in two operational scenarios—four F-16s versus four F/A-18s at Nellis AFB, and in a combined air and ground scenario with a robust Integrated Air Defense System known as the Graduation Exercise at China Lake. Individual aspects of system performance were evaluated during both operational scenarios and other operational testing at China Lake.

Analysis of operational testing included both qualitative and quantitative measures documenting direct system performance measures and evaluation of system performance via pilot reports. A key feature throughout the evaluation was direct side-by-side comparisons by the same pilots in the same scenarios with the current F/A-18 RWR, the ALR-67E (V)2. Based on results from OPEVAL completed in February 1999, the August 1999 B-LRIP report stated that ASR was operationally effective and

operationally suitable on the F/A-18C/D. ALR-67 (V)3 demonstrated improved detection, identification, localization, and warning to a wide range of threat RF radar systems when compared to the ALR-67E (V)2. It also demonstrated that it improved pilot situational awareness, contributing to more effective mission accomplishment. The ALR-67 (V)3 demonstrated overall high reliability during flight testing with 23 mission critical and nine non-mission critical failures during 967 flight hours. Of the failures, nine were due to BIT false alarms, seven were due to radome or antenna failures, six were due to actual hardware failures of the weapons replaceable assemblies (WRAs), and the rest were software and non-critical failures. Analysis of failure data indicates the system meets objective criteria in most cases, with antenna radome reliability, system maintainability, and logistics supportability as areas needing improvement. The demonstrated Mean Time Between Critical Failure was 42 hours (threshold was 17 hours).

Immediately following the completion of ALR-67(V)3 OPEVAL, the system entered FOT&E on the F/A-18E/F during that aircraft's OPEVAL.

TEST & EVALUATION ACTIVITY

Based on OPEVAL results, DOT&E has identified the following items to be resolved during FOT&E (with no particular timeline): (1) identifying and correcting the causes of ALR-67(V)3 radome/antenna failures; (2) correcting maintainability/logistic supportability issues; (3) verifying and re-testing system MMW performance; (4) improving system BIT interpretability and troubleshooting guides; (5) correcting threat signal blanking between the ALR-67(V)3 and ALQ-126B; (6) demonstrating the capability to create and promulgate an operational UDF in a timely manner; and (7) completing ALR-67(V)3 user manuals. Additional recommended improvements include: (1) correcting joint interoperability and identification of friendly AI radar problems; (2) improving the Inertial Navigation System smoothing rate to provide the most accurate estimate of threat placement (RWR display symbology); and (3) improving the HARM command launch computer interface to properly indicate actual HARM status rather than an ALR-67(V)3 degrade when the last HARM is expended.

Two issues were specifically identified to be resolved prior to FOT&E: (1) misidentification of one mode of a Blue AI radar as a more lethal mode, and (2) reduction or elimination of master resets.

The purpose of FOT&E, which ran from June-November 1999, was to resolve some of the issues identified above, and to determine system operational effectiveness and operational suitability as installed on the F/A-18E/F. The (V)3 was evaluated on five different F/A-18E/F aircraft and accumulated 627 flight hours and 183 catapult launches and arrested landings during 445 sorties. FOT&E was conducted at the ECR (China Lake) and adjoining air space, NAS Key West, FL, Nellis AFB, NV, and aboard an aircraft carrier.

TEST & EVALUATION ASSESSMENT

FOT&E determined the (V)3 to be operationally effective, but not operationally suitable on the F/A-18E/F, and did not recommend fleet introduction until able to identify and correct the cause of: (1) uncommanded power downs; (2) aft radome failures; (3) wire bundle chafing; (4) high BIT false alarm rates. Of the issues specifically identified by OPTEVFOR for correction and re-test, the first was corrected (Blue AI identification), while the second was not (master resets). MMW performance was re-tested and found to be satisfactory, and the user manual was completed and found to be adequate.

All the above, except the radome failures which were identified during OPEVAL, are issues unique to the installation of the ALR-67(V)3 on the F/A-18E/F.

Of the old and new issues awaiting correction and re-test, three are likely to be the most difficult to resolve: (1) BIT interpretability and false alarm rate; (2) system master resets; and (3) logistic supportability (USM-406D). All three are issues that frequently plague EW systems from cradle to grave, and reduce readiness and system supportability.

DOT&E will continue to monitor and report ALR-67 (V)3 test and evaluation activity until all issues identified in the BLRIP report are resolved. The Navy has embarked on a proactive program to correct deficiencies noted during OT-IIB and FOT&E to ensure an operationally effective and suitable system prior to fleet introduction. A Verification of Correction of Deficiencies identified during FOT&E is scheduled for FY01.